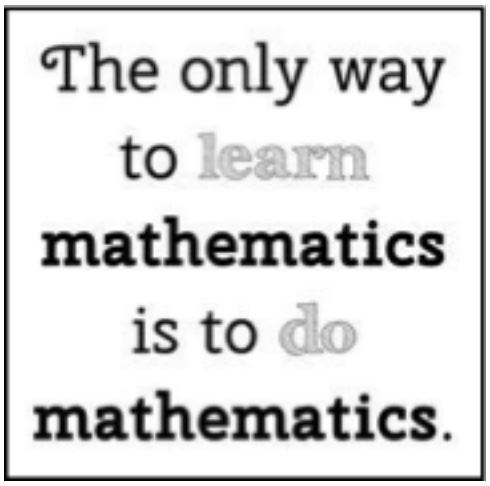
Yr11 Preparations

Effort		
R	A	G

GCSE Maths



Calculator Practice Booklet (H)

Name: _____

Paper 2 – Calculator

Week	Topics	R	A	G
	Number			
	Rounding & Estimating			
	Limits of Accuracy			
	Calculator Calculations			
	Percentage Increase / Decrease, Change			
	Reverse Percentages			
	Compound Interest			
	Rules of indices			
	Algebra			
	Expanding Brackets			
	Simultaneous Equations			
	Quadratic Graphs			
	Quadratic Equations			
	Equation of a Circle			
	Inequalities			
	Iteration			
	Ratio & Proportion			
	Ratio Problems			
	Compound Measures			
	Direct & Inverse Proportion - Algebraically			
	Geometry			
	Volume			
	Arcs & Sectors			
	Angles on Parallel Lines			
	Trigonometry – SOH CAH TOA			
	Trigonometry – Sine & Cosine			
	Trigonometric Graphs			
	Combined Transformations			
	Statistics & Probability			
	Averages from Frequency Tables			
	Frequency Polygons			
	Histograms			

Topics

Number

Rounding & Estimating

Question 1

Write 0.0166 correct to two significant figures.

.....

(1 mark)

Question 2

Select the **best** estimate of the answer to

$$32.7 \times 0.48$$

[ ] 1.2

[ ] 1.6

[ ] 12

[ ] 16

[ ] 120

[ ] 160

Question 3

A solid metal sphere has radius 9.8 cm.
The metal has a density of 5.023 g/cm ^{3}.

Find an estimate for the mass of the sphere, giving your answer in kilograms.

[The volume V of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... kg

Question 4

The diagram shows the positions of two towns, *A* and *B*.

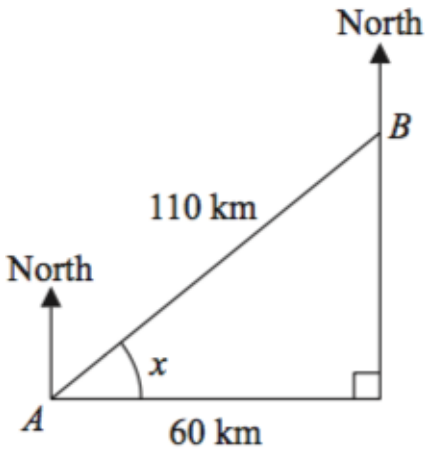


Diagram **NOT** accurately drawn

The distance from *A* to *B* is 110 km correct to 2 significant figures.

Write down the upper bound for the distance from *A* to *B*.

..... km

(1 mark)

Question 5

A field is in the shape of a rectangle.
The width of the field is 28 metres, measured to the nearest metre.
The length of the field is 145 metres, measured to the nearest 5 metres.

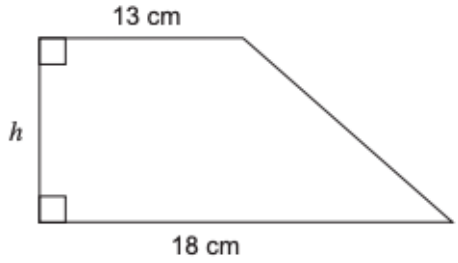
Work out the upper bound for the perimeter of the field.

..... m

(3 marks)

Question 6

The area of this trapezium is 280 cm ^{2} to the nearest 10 cm ^{2}



Not drawn accurately

The lengths 13 cm and 18 cm are given to the nearest centimetre.

Work out the maximum possible value of the height h.

$h =$ ..... cm

(4 marks)

Question 7

$$p = \frac{q}{\sqrt{r}}$$

$q = 2.22$correct to 2 decimal places.
$r = 0.71$ correct to 2 decimal places.

By considering bounds, work out the value of p, giving your answer to a suitable degree of accuracy.

.....

Question 8

$$x = \frac{y}{z + w}$$

$y = 0.057$correct to 3 decimal places.
$z = 0.08$correct to 1 significant figure. $w = 0.641$ correct to 3 significant figures.

By considering bounds, work out the value of x, giving your answer to a suitable degree of accuracy.

.....

Calculator Calculations-N/A

Question 9

Calculate.

$$\sqrt{12.25^3}$$

Give your answer correct to 1 decimal place.

.....

(2 marks)

Question 10

Use your calculator to work out

$$\frac{\sqrt{2.5^2 + 3.75}}{3.9 - 1.7}$$

Write down all the figures on your calculator display.
You must give your answer as a decimal.

.....

(3 marks)

Question 11

Work out.

$$\sqrt{\frac{2.52 + 4.78}{1.29}}$$

Give your answer correct to three significant figures.

.....

(2 marks)

Percentage Increase / Decrease, Change

Question 12

The table gives information about the price of gold.

	1st February 2016	1st March 2016
Price of one ounce of gold (dollars)	1126.50	1236.50

Work out the percentage increase in the price of gold between 1st February 2016 and 1st March 2016
Give your answer correct to 3 significant figures.

..... % increase

(3 marks)

Question 13

Shari buys a box of 60 candles for £125.
She sells the candles for £2.25 each.

Calculate her percentage profit.

..... %

(4 marks)

Question 14

On Monday, Nalim made a journey.
On Tuesday, she made the same journey.
Her average speed on Tuesday was 25% greater than her average speed on Monday.

Calculate the percentage reduction in the time her journey took on Tuesday compared with Monday.

..... %

(3 marks)

Question 15

Work out the price of the car before it was reduced.

£ .....

(3 marks)

Question 16

Georgie had her roof repaired.
She was charged an extra 2·5% for late payment.
She had to pay a total of £977·85.

Calculate how much she would have **saved** if she had paid on time.

£ .....

(3 marks)

Question 17

Simon invested an amount of money in a savings account at 0.5% per annum compound interest.
At the end of 3 years, the amount of money in the savings account was £12,180.90

Work out how much money Simon invested in the savings account.

£ .....

(3 marks)

Question 18

25 years ago, Raveena's grandparents invested £500 for her in an account pay 3.4% compound interest per annum.
No extra money was paid in and no money was withdrawn during these 25 years.

Raveena has decided to withdraw all the money in the account after 25 years.

How much should Raveena receive?
Give your answer correct to the nearest penny.

£ .....

(3 marks)

Question 19

Here are the interest rates for two accounts.

Account A	Account B
Interest: 3% per year compound interest.	Interest: 4% for the first year, 3% for the second year and 2% for the third year.
No withdrawals until the end of three years.	Withdrawals allowed at any time.

Derrick has £10,000 he wants to invest.

Calculate which account would give him most money if he invests his money for 3 years.

Give the difference in the interest to the nearest penny.

Account .....

by ..... p

(5 marks)

Question 20

Simon invested £20 000 at a compound interest rate of 2.5% per annum.
At the end of n years the investment has a value of £V.

Write down a formula for V in terms of n.

$V =$ .....

(2 marks)

Rules of indices-102 - 104, 108 - 110

Question 21

Simplify fully

$$\frac{w^3 \times w^4}{w^2}$$

.....

Question 22

Given that $2^p \times 8^q = 2^n$ express n in terms of p and q.

$n =$ .....

(2 marks)

Question 23

Work out the value of

$$25^{-\frac{1}{2}} \times 81^{\frac{3}{4}}$$

.....

(3 marks)

Algebra

Expanding Brackets

Question 24

Expand and simplify

$$(3x - 4y)(x + 3y)$$

.....

(2 marks)

Question 25

Expand and simplify

$$(x + 2)(2x - 3)(3x + 1)$$

.....

(3 marks)

Question 26

Expand and simplify $(2x - 1)(x + 3)(x - 5)$

.....

(3 marks)

Question 27

John bought 7 bags of cement and 3 bags of gravel. The total weight of these bags was 215 kilograms.
Shona bought 5 bags of cement and 4 bags of gravel. The total weight of her bags was 200 kilograms.

Calculate the weight of one bag of cement and the weight of one bag of gravel.

One bag of cement weighs ..... kg

One bag of gravel weighs ..... kg

(4 marks)

Question 28

Solve the simultaneous equations

$$2x^2 + 3y^2 = 14$$

$$x = 2y - 3$$

.....

(5 marks)

Question 29

The line $y = 4 - 4x$ intersects the curve $y = 3(x^2 - x)$ at the point A and B.

Use an algebraic method to find the coordinates of A and B.

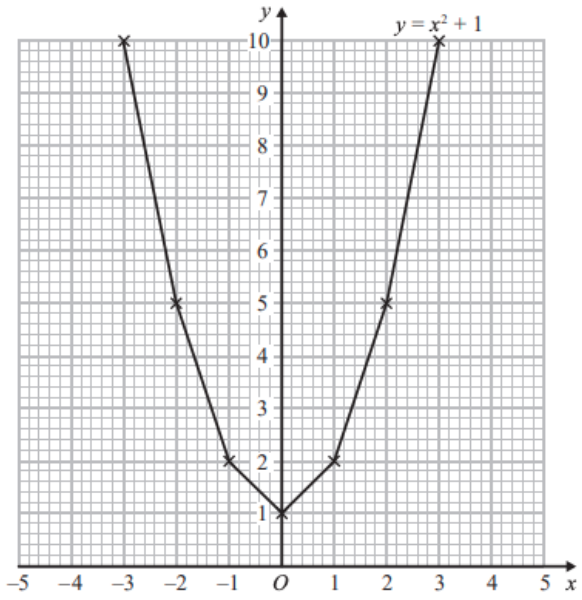
.....

Quadratic Graphs

Question 30

Brogan needs to draw the graph of $y = x^2 + 1$

Here is her graph.



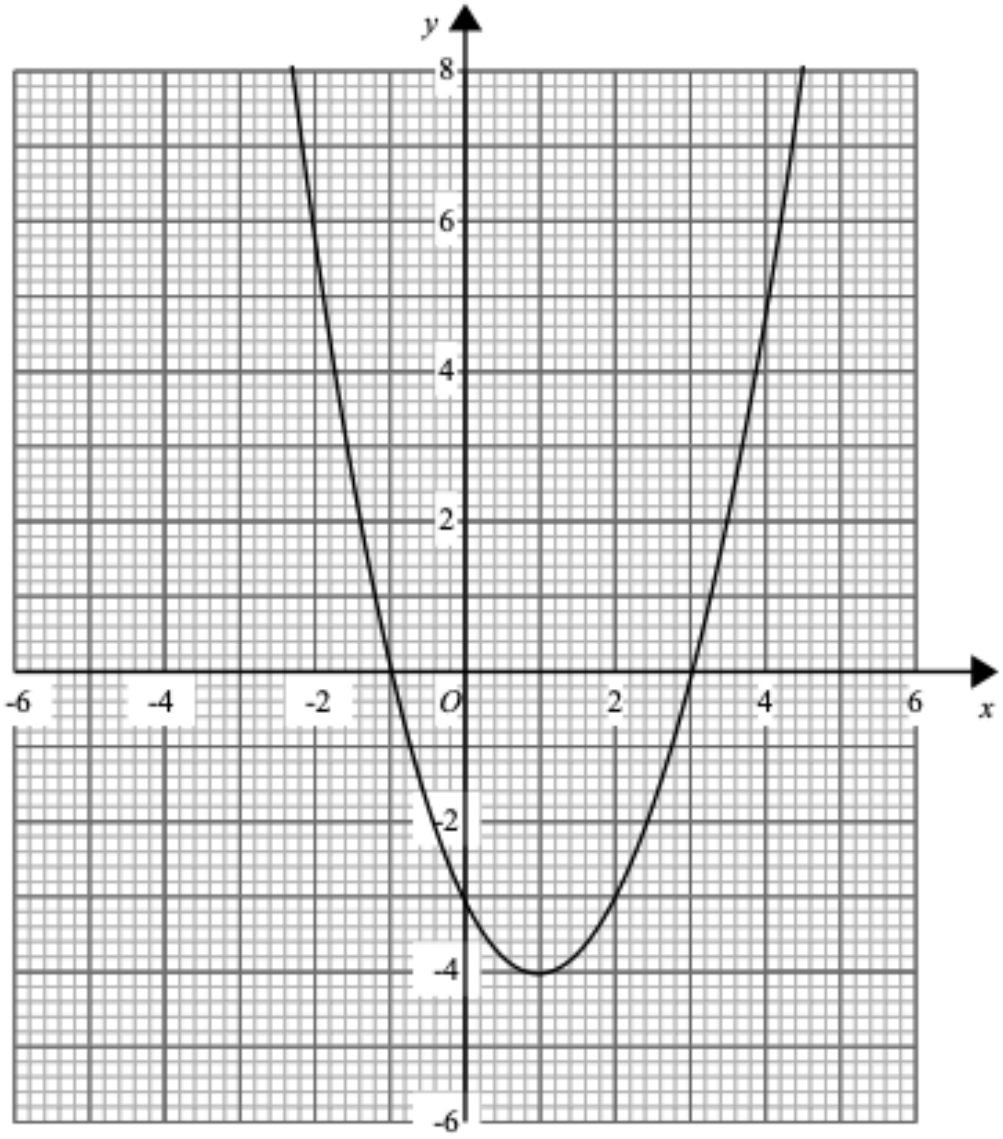
Write down one thing that is wrong with Brogan's graph.

.....

(1 mark)

Question 31

Here is the graph of $y = x^2 - 2x - 3$



(a) Write down the turning point of the graph $y = x^2 - 2x - 3$

(……, ……)

(1)

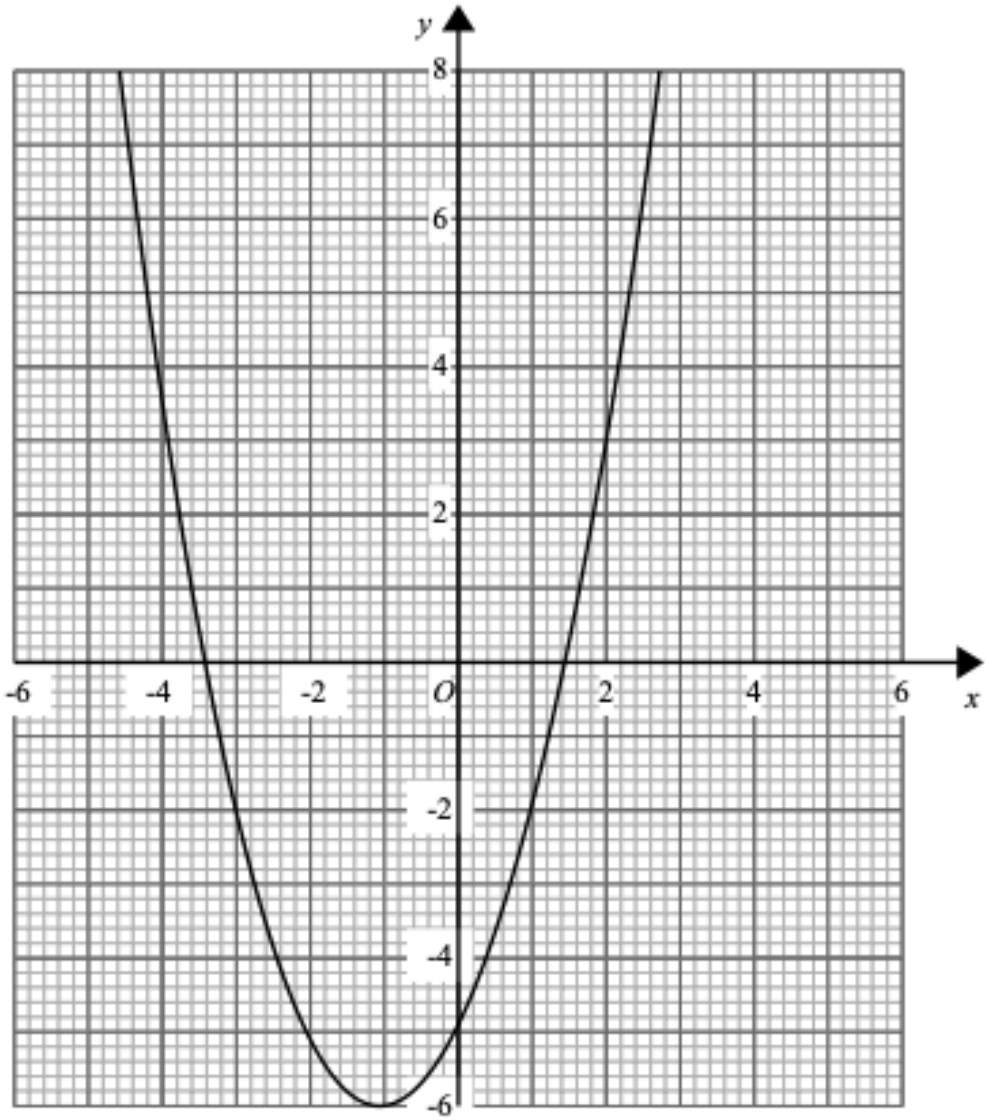
(b) Use the graph to find the roots of the equation $x^2 - 2x - 3 = 0$

……

(2)

Question 32

Here is the graph of $y = x^2 + 2x - 5$



(a) Write down the turning point of the graph $y = x^2 + 2x - 5$

(..... , ...)

(1)

(b) Use the graph to find the roots of the equation $x^2 + 2x - 5 = 2$

.....

(2)

Question 33

Solve the equation

$$2x^2 + 7x - 15 = 0$$

.....

(3 marks)

Question 34

Solve the equation $2x^2 + 5x - 4 = 0$.

Give your answers correct to one decimal place.

.....

(3 marks)

Question 35

The diagram shows a trapezium.

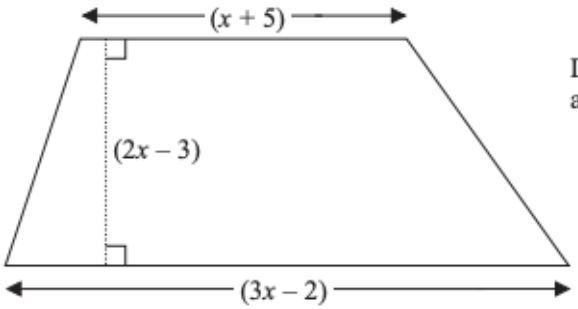


Diagram **NOT** accurately drawn

All measurements shown on the diagram are in centimetres.

The area of the trapezium is 133 cm ^{2}

It can be shown that $8x^2 - 6x - 275 = 0$

Find the value of x.

$x =$ ..... cm

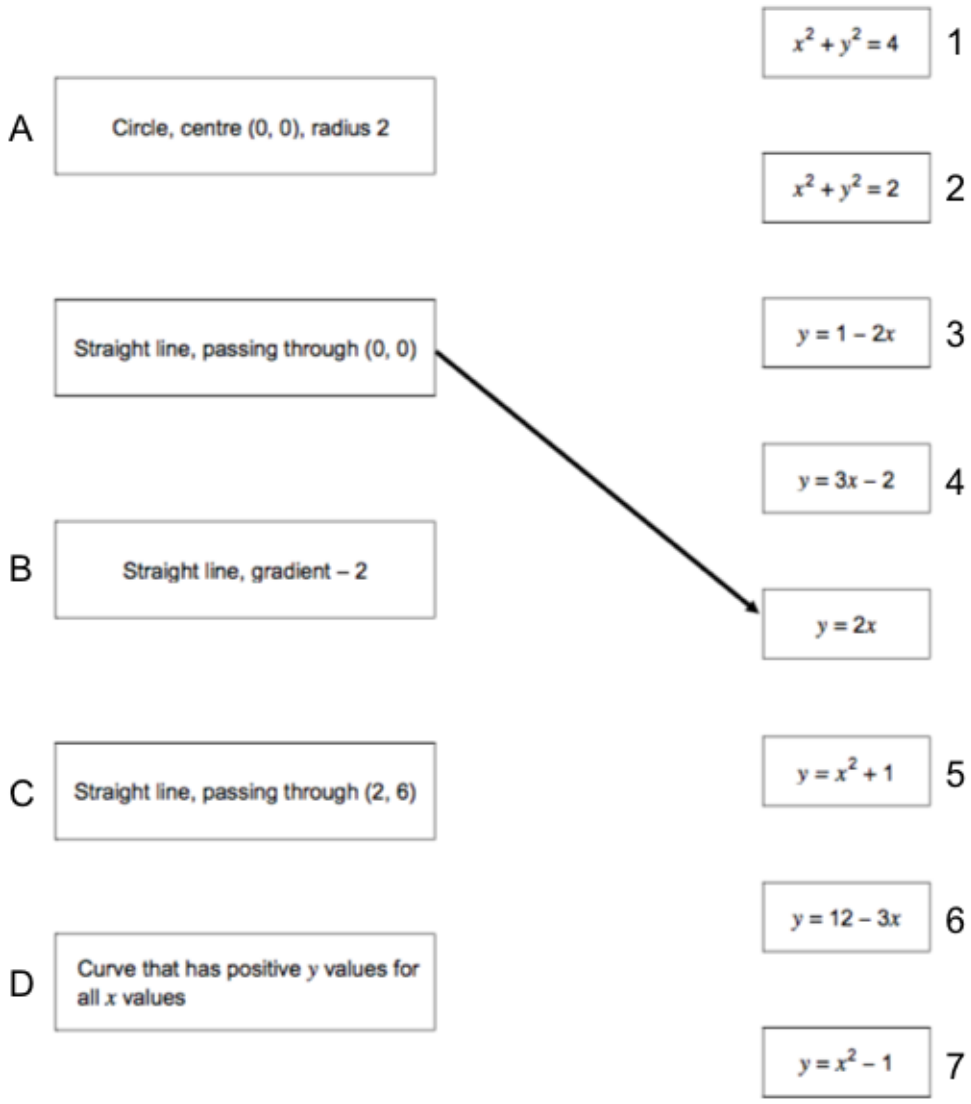
(3 marks)

Equation of a Circle

Question 36

Match each graph with the correct equation.
You will **not** use all of the equations.

One has been done for you.



A matches with .....

B matches with .....

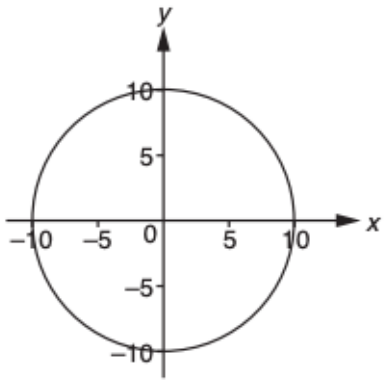
C matches with .....

D matches with .....

(4 marks)

Question 37

The diagram shows a circle, centre the origin.



Write down the equation of the circle.

.....

(1 mark)

Question 38

In this question, all lengths are in centimetres.

A circle has equation $x^2 + y^2 = 49$.

Points A, B and C all lie on this circle.
Their co-ordinates are $A(a, 0)$, $B(b, 0)$ and $C(c, 0)$, where $a < 0$, $b > 0$ and $c > 0$.

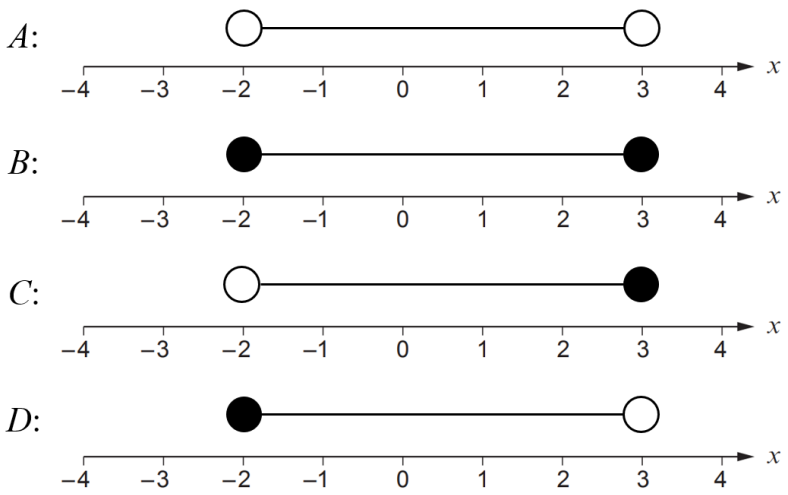
Find the length of the line AB.

$AB =$ ..... cm

(2 marks)

Question 39

Which diagram (A, B, C or D) shows the correct represention of the inequality $-2 \leq x \leq 3$ on the number line.



[ ] A

[ ] B

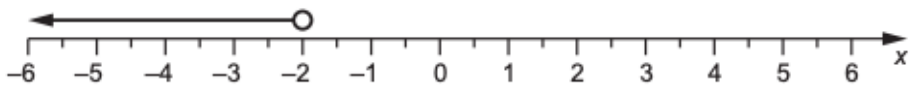
[ ] C

[ ] D

(1 mark)

Question 40

Gemma's solution to the inequality $3x + 1 > -5$ is shown on the number line.



Is Gemma's solution correct?

[ ] Yes

[ ] No

(3 marks)

Question 41

Solve the inequality $7 < 4x - 1 \leq 17$

.....

(3 marks)

Iteration - 322

Question 48

Starting with $x_0 = 2$, use the iteration formula $x_{n+1} = \sqrt[3]{3x_{n^2} - 3}$to find the value of x_2.

Give your answer correct to 3 decimal places.

$x_2 =$ .....

(3 marks)

Question 49

$$V_0 = 10000$$

$$V_{n+1} = 0.8V_n$$

where $n \geq 0$

This iteractive formula can be used to work out the value V_n of a particular type of car when it is $n$years old.

Use this formula to find the value of a car of this type that is 3 years old.

Value is £ .....

(3 marks)

Question 50

The number of moose in Alaska at the start of year n is P_nThe number of moose in Alaska at the start of the following year is given by

$P_{n+1} = 1.04(P_n - G)$ where G is a constant.

At the beginning of 2015, there were 200 000 moose in Alaska.
At the beginning of 2016, there were 200 720 moose in Alaska.

Work out how many moose there were in Alaska at the beginning of 2017

.....

(4 marks)

Ratio & Proportion

Ratio Problems

Question 51

Emma has a digital photo.

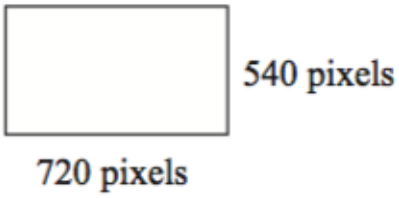


Diagram **NOT** accurately drawn

The photo has a width of 720 pixels. The photo has a height of 540 pixels.

The ratio of the width of the photo to the height of the photo is $4:3$.

Emma wants the ratio of the width of the photo to the height of the photo to be 3 : 2
She reduces the number of pixels in the height of the photo.
The width of the photo is still 720 pixels.

The ratio of the width of the photo to the new height of the photo is 3 : 2

(b) Work out the new height of the photo.

..... pixels

(2 marks)

Question 52

The organisers of a teachers' conference provided a buffet lunch made by a catering service.

The catering service made a total of 560 cups of tea and coffee.
These were served in the ratio $5:3$ respectively.

The catering service billed the conference organise £1 for each cup of tea and £1.50 for each cup of coffee served.

How much was the total bill for the tea and coffee?

Total bill for tea and coffee £ .....

(4 marks)

Question 53

The points $A(-1,-7)$ and $B(24,23)$ are on a straight line ACB.

$$AC:CB = 2:3$$

Work out the coordinates of C.

.....

Question 54

Three electric cars are tested by driving them around a track until the battery runs out.
The table shows some information about their performance.

Complete the table.

Car	Total time travelled (hours)	Average speed (km/h)	Total distance travelled (km)
A	4	35	.....
B	.....	40	180
C	3	.....	150

(3 marks)

Question 55

James and Peter cycled along the same 50 km route.

James took $2\frac{1}{2}$ hours to cycle the 50 km.

Peter started to cycle 5 minutes after James started to cycle.
Peter caught up with James when they had both cycled 15 km.

James and Peter both cycled at constant speeds.

Work out Peter's speed.

..... km/h

(5 marks)

Question 56

In 2018, a racing driver was allowed to use the Drag Reduction System provided that the car was within 1 second of the car ahead. Suppose that two cars were 1 second apart, each travelling at 180 km/h (in the same direction!).

How many metres apart were they?

..... m

Direct & Inverse Proportion - Algebraically

Question 57

T is directly proportional to the cube of $rT = 21.76$ when $r = 4$

It can be shown that $T = 0.34r^3$

Work out the value of T when $r = 6$

$T =$ .....

(1 mark)

Question 58

y is inversely proportional to the square root of x.

y is 40 when x is 9.

Find a formula linking x and y.

$y =$ **.....**

(3 marks)

Question 59

y is directly proportional to the square of x.

Find the percentage increase in y when x is increased by 15%.

..... %

(4 marks)

Geometry

Volume-568 -570

Question 60

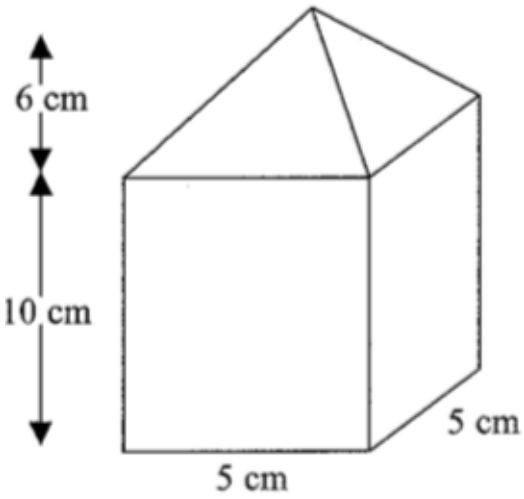


Diagram **NOT** accurately drawn

The diagram shows a model.
The model is a cuboid with a pyramid on top.
The base of the model is a square with sides of length 5 cm.
The height of the cuboid in the model is 10 cm.
The height of the pyramid in the model is 6 cm.

Calculate the volume of the model.

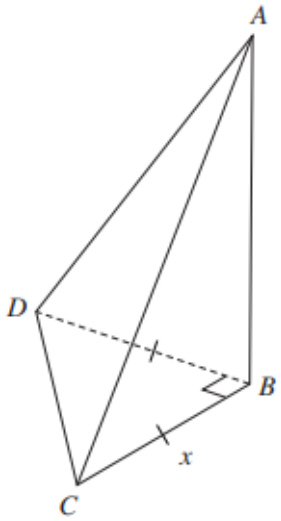
..... cm^3

Question 61

$ABCD$is a triangular based pyramid.

The base $BCD$is a right-angled triangle.A is directly above B.$BC = BDAB = 2 \times BC$The volume of the pyramid is 72 cm ^{3}.

The formula for the volume of a pyramid is $\frac{1}{3}$ × base area × height.



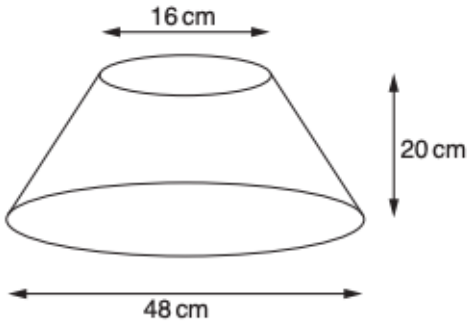
Calculate the length of BC, labelled x in the diagram.

..... cm

(3 marks)

Question 62

The diagram shows the frustum of a cone.



The radius of the base is 24 cm and the radius of the top is 8 cm.
The perpendicular height is 20 cm.

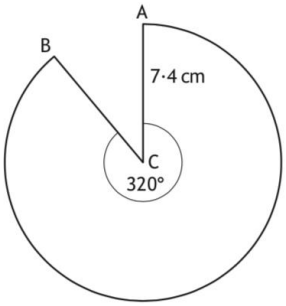
Calculate the volume of the frustum.

..... cm^3

(6 marks)

Question 63

The diagram below shows a sector of a circle, centre C.



The radius of the circle is 7.4 centimetres.

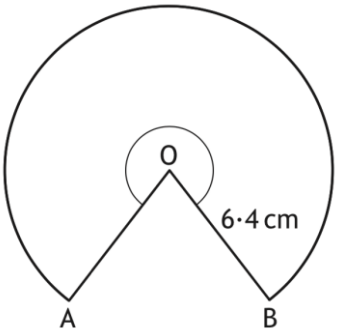
Calculate the length of the major arc AB.

..... cm

(3 marks)

Question 64

The diagram below shows part of a circle, centre O.



The radius of the circle is 6.4 centimetres.
Major arc AB has length 31.5 centimetres.

Calculate the size of the reflex angle AOB.

..... °

(3 marks)

Question 65

The diagram shows a metal plate.

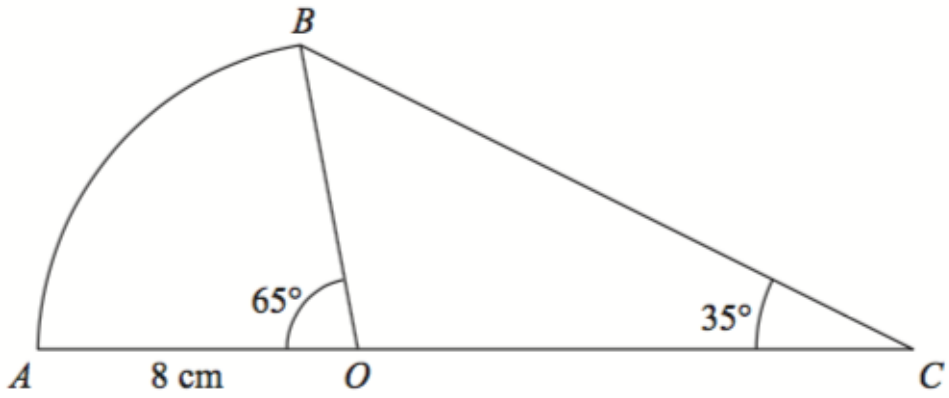


Diagram **NOT** accurately drawn

The metal plate is made from a sector *OAB* of a circle, centre *O*, and a triangle *OCB*.

Angle *AOB* = 65Â° Angle *OCB* = 35Â°.
OA = *OB* = 8 cm.
AOC is a straight line.

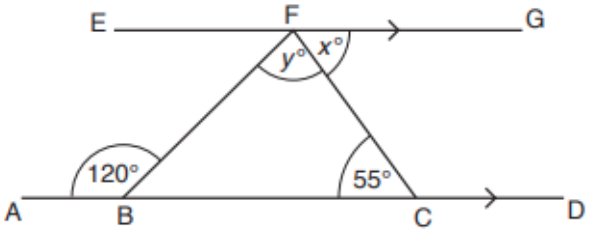
Given that $BC = 12.6$cm correct to 3 significant figures, calculate the total area of the metal plate.
Give your answer correct to 3 significant figures.

..... cm^2

(4 marks)

Question 66

In the diagram, $ABCD$ is parallel to EFG.
Angle $BCF = 55°$ and angle $ABF = 120°$.



Not to scale

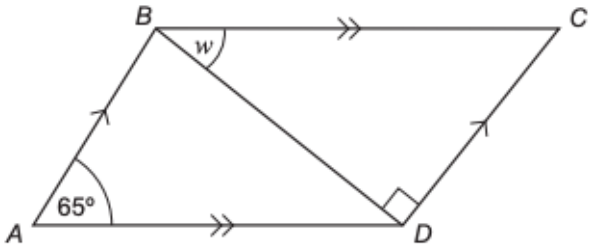
Work out y.

$y =$ ..... °

(2 marks)

Question 67

$ABCD$is a parallelogram.BD is a diagonal.



Not drawn accurately

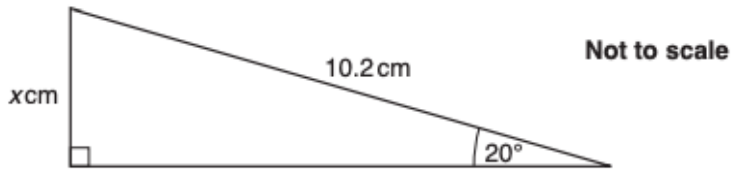
Work out the size of angle w.

..... °

(3 marks)

Question 68

Here is a right-angled triangle.



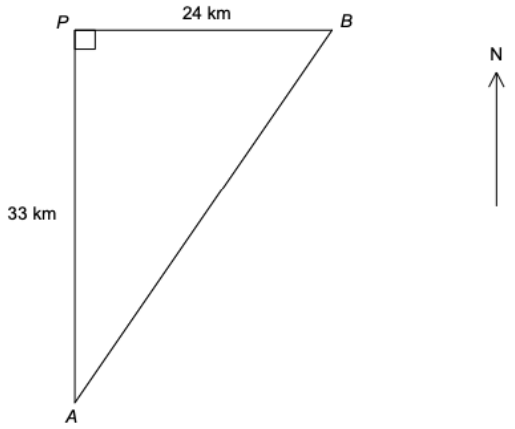
Use trigonometry to work out the value of x.

$x =$ ..... cm

(3 marks)

Question 69

The diagram shows the positions of two ships A and B.
Ship B is 33 km North and 24 km East of A.

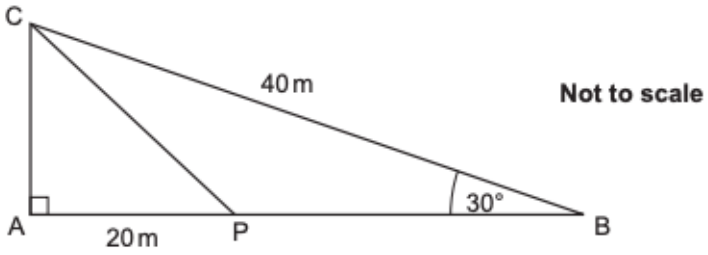


Work out the three-figure bearing of B from A.
Give your answer to the nearest degree.

..... °

Question 70

In the diagram, ABC is a right-angled triangle. P is a point on AB. $BC = 40$ m, $AP = 20$ m and angle $ABC = 30^{\circ}$.



Find the length of AC.

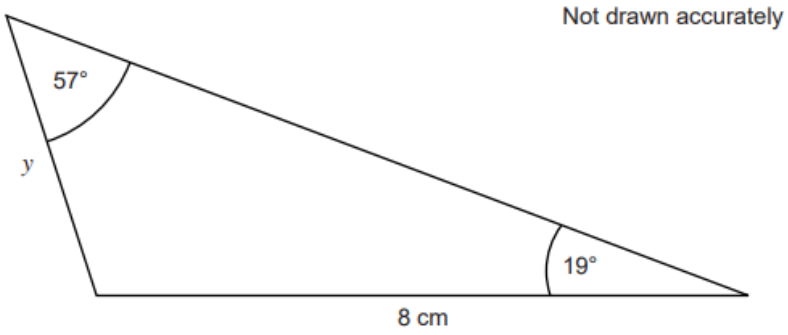
$AC =$ ..... m

(3 marks)

Trigonometry, Sine & Cosine

Question 71

Work out the length y.



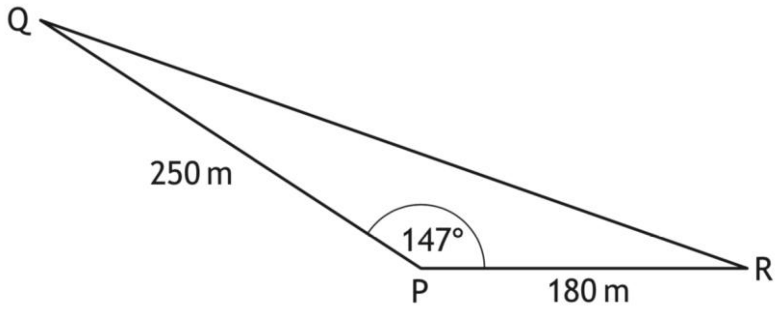
Give your answer to 1 decimal place.

.....

(1 mark)

Question 72

A piece of land is in the shape of a triangle as shown.



$bullet\ \ quad PQ$ =250 metres $bullet\ \ quad PR$ =180 metres $bullet\ \ quad$ angle $QPR = 147^\circ$

The owner wishes to build a fence along the side QR.
Calculate the length of the fence.

..... m

(3 marks)

Question 73

ABC is an arc of a circle with centre *O* and radius 8 cm.
AC is a chord of the circle.
Angle *AOC* = 120°

Calculate the perimeter of the shaded segment.
Give your answer correct to 3 significant figures.

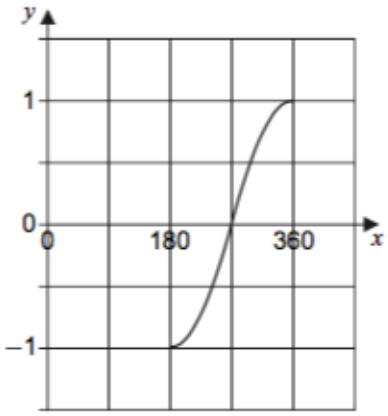
..... cm

(5 marks)

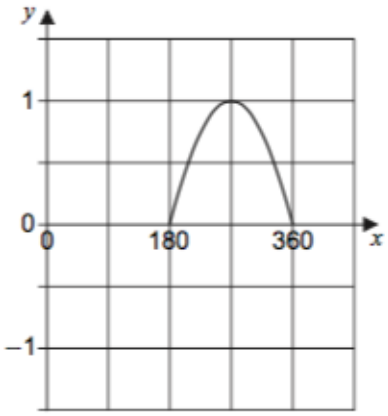
Question 74

Four graphs are shown for $180^\circ \leq x \leq 360^\circ$

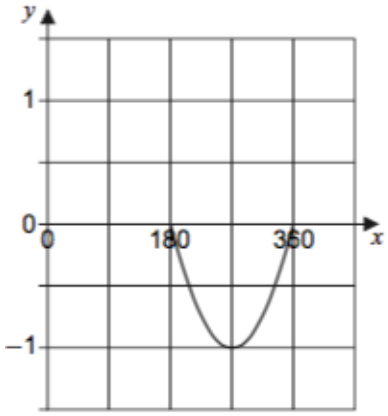
Graph A



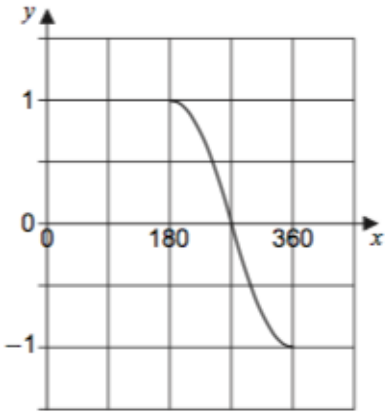
Graph B



Graph C



Graph D



Which graph is $y = cos\ x$?

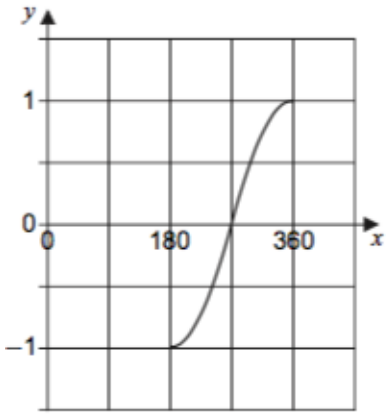
Graph .....

(1 mark)

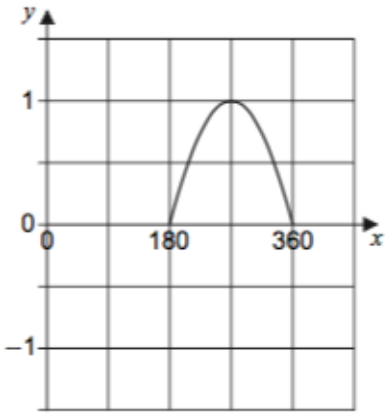
Question 75

Four graphs are shown for $180^\circ \leq x \leq 360^\circ$

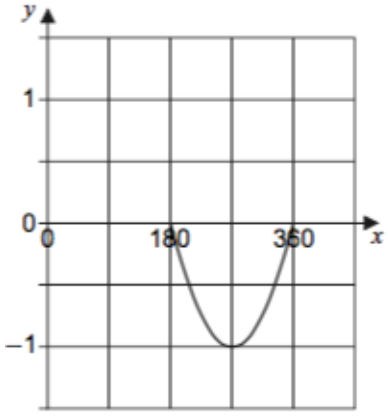
Graph A



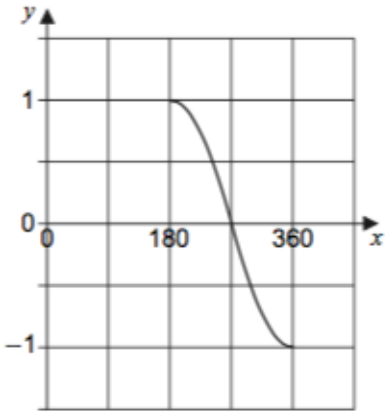
Graph B



Graph C



Graph D

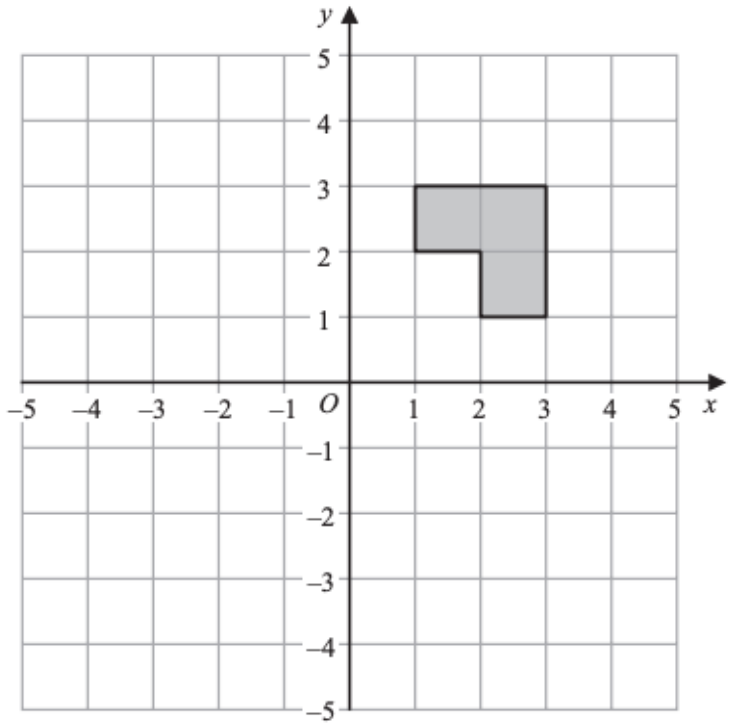


Which graph is $y = sin\, x$?

Graph .....

(1 mark)

Question 76

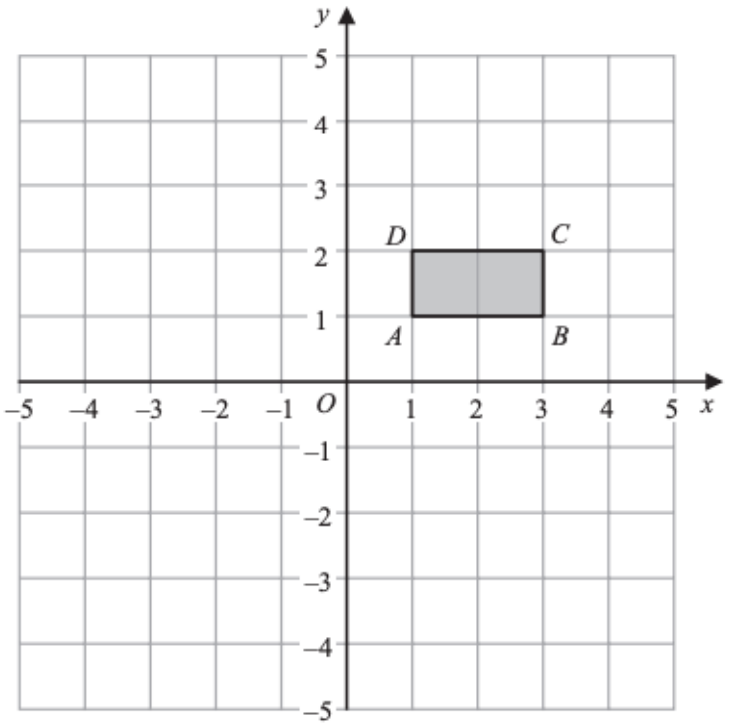


The shaded shape is rotated 180° about the point $(2,2)$

How many of the vertices of the shaded shape are invariant?

..... vertex/vertices

Question 77



Rectangle $ABCD$ is transformed by a combination of two transformations so that

all points on AB are invariant
and there are no other invariant points.

The first transformation is

a reflection in the line with equation $y = k$, where k is an integer and $k \neq 1$

Describe fully the second transformation.

.....

(2 marks)

Statistics & Probability

Averages from Frequency Tables-414 -418

Question 78

The table shows information about the number of gold medals won by each of 8 countries at the 2016 Olympics.

Country	Number of gold medals
China	26
France	10
Germany	17
Great Britain and Northern Ireland	27
Japan	12
Russia	19
South Korea	9
United States	46

Work out the mean number of gold medals.

..... gold medals

(2 marks)

Question 79

The frequency table gives information about the numbers of mice in some nests.

Number of mice	Frequency
5	4
6	13
7	16
8	x
9	6

The mean number of mice in a nest is 7

Work out the value of x.

$x =$ ..... mice

(4 marks)

Question 80

The table shows information about the pay per hour of 40 people

Pay per hour, x (£)	Frequency
$5 < x \leqslant 15$	14
$15 < x \leqslant 25$	12
$25 < x \leqslant 35$	11
$35 < x \leqslant 45$	2
$45 < x \leqslant 55$	1
	Total = 40

Which group contains the median pay per hour?

[ ] $5 < x \leq 15$

[ ] $15 < x \leq 25$

[ ] $25 < x \leq 35$

[ ] $35 < x \leq 45$

[ ] $45 < x \leq 45$

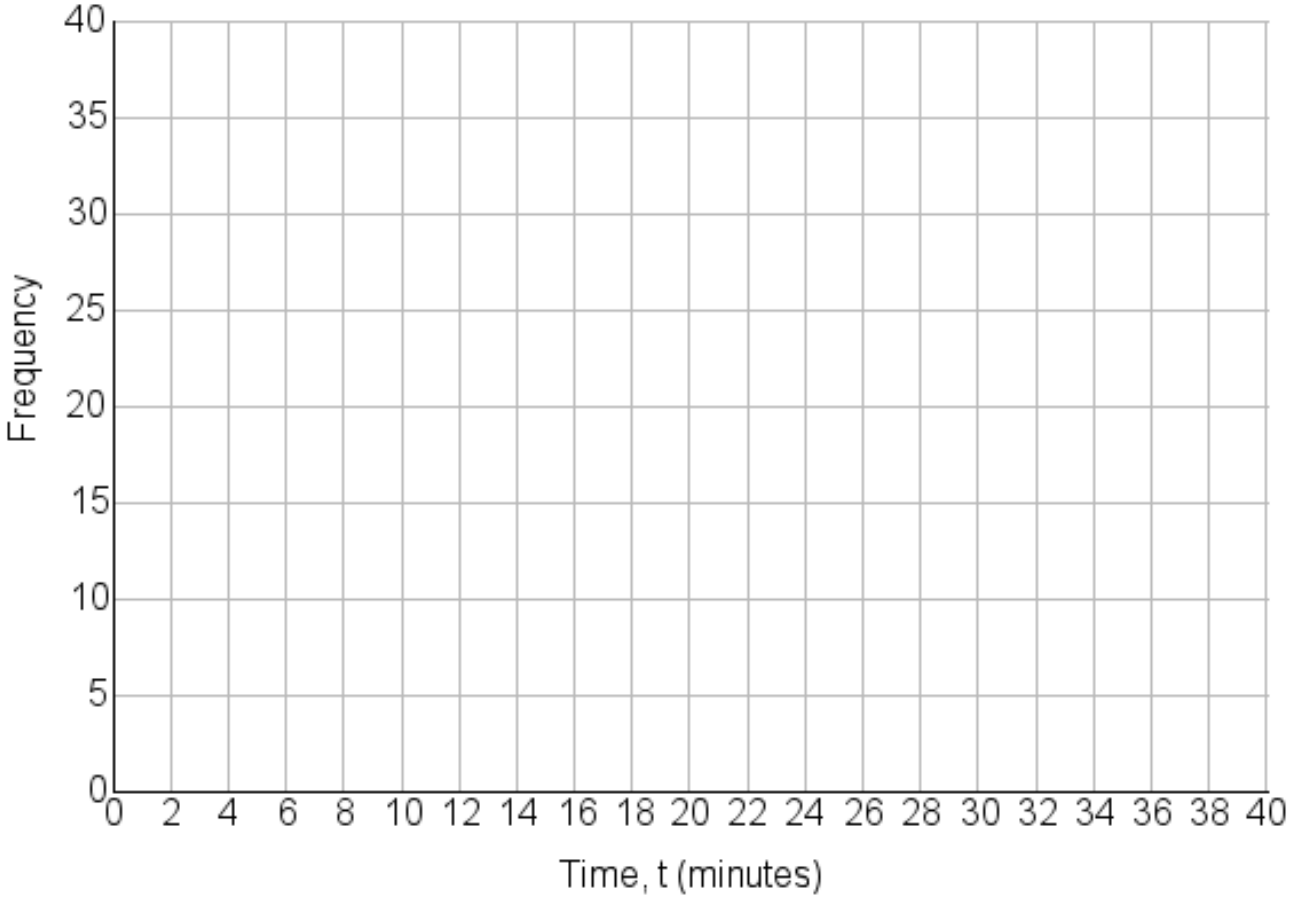
Frequency Polygons

Question 81

The times taken by 100 students to travel to school are shown.

Time, t (minutes)	Frequency
$0 < t \leqslant 10$	36
$10 < t \leqslant 20$	34
$20 < t \leqslant 30$	18
$30 < t \leqslant 40$	12

Draw a frequency polygon for the data.

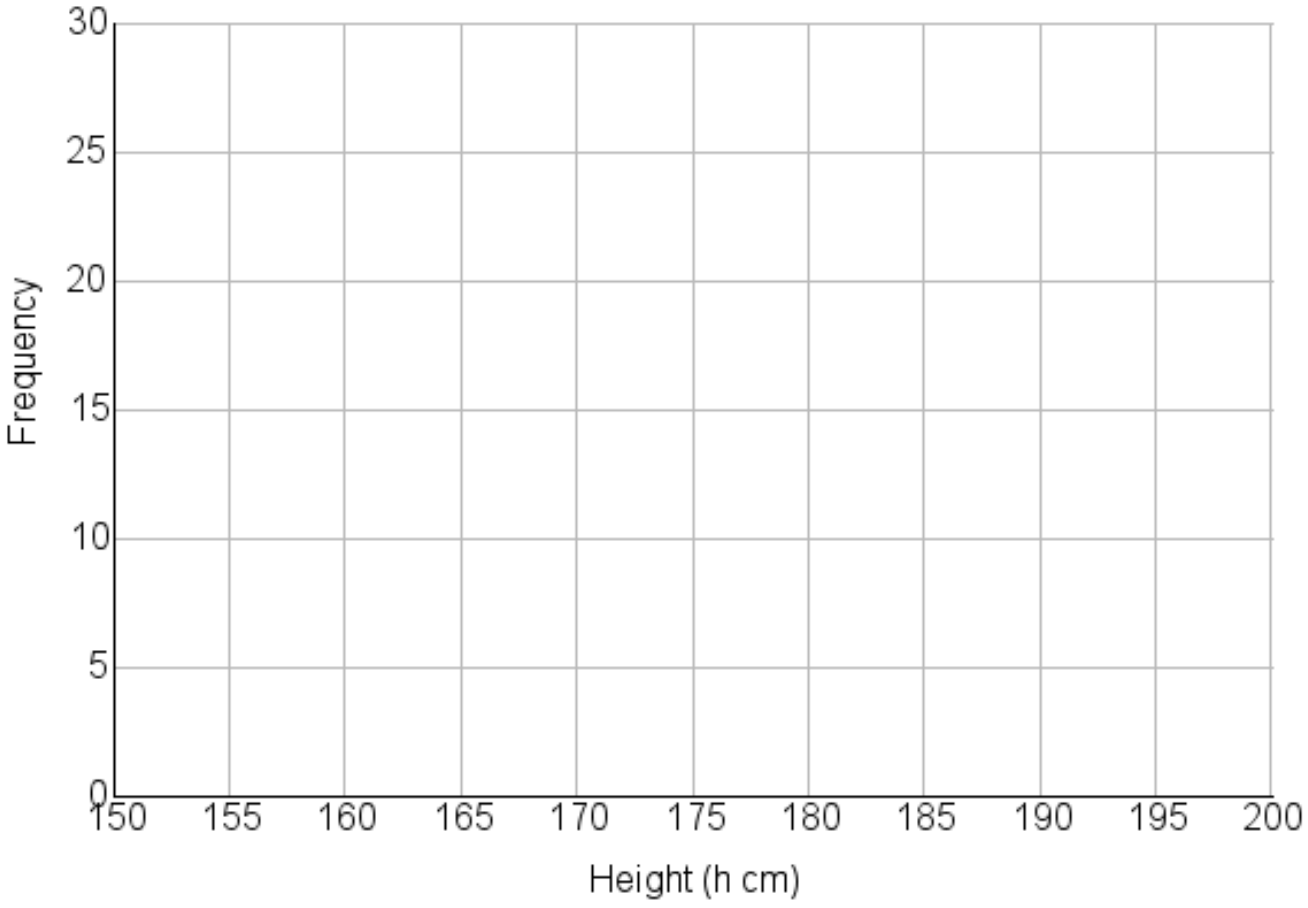


Question 82

The frequency table gives information about the heights of some people.

Height (h cm)	Frequency
$160 < h \leq 165$	2
$165 < h \leq 170$	5
$170 < h \leq 175$	10
$175 < h \leq 180$	21
$180 < h \leq 185$	16
$185 < h \leq 190$	4

Draw a frequency polygon for this information.



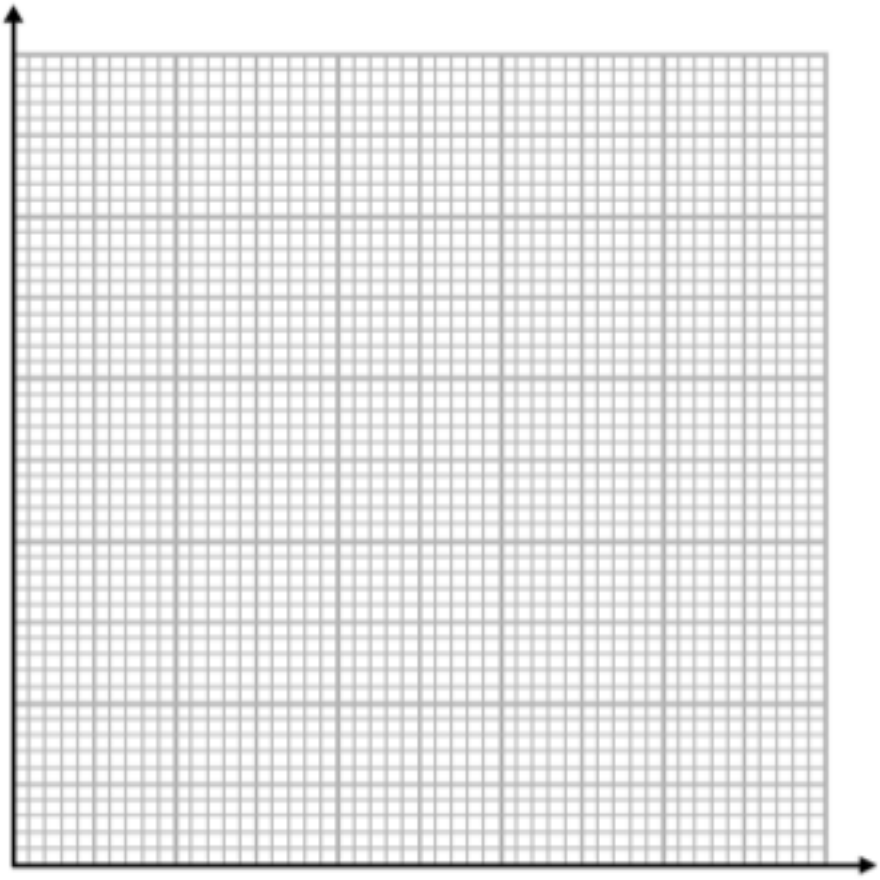
(2 marks)

Question 83

The table shows information about the age of 80 teachers.

Age (years)	Frequency
$20 < a \leqslant 30$	20
$30 < a \leqslant 35$	22
$35 < a \leqslant 40$	16
$40 < a \leqslant 50$	13
$50 < a \leqslant 65$	9

On the grid, draw a histogram for the information in the table.

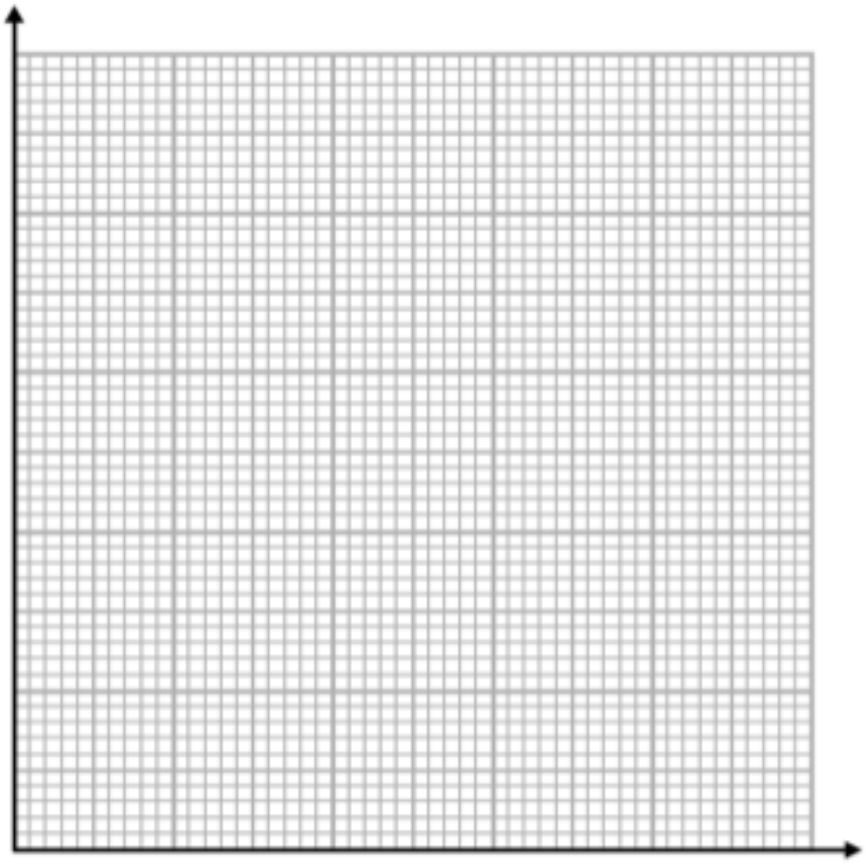


Question 84

The table shows information about the speed, in mph, of some cars.

Speed (mph)	Frequency
$40 < s \leqslant 55$	6
$55 < s \leqslant 60$	10
$60 < s \leqslant 65$	46
$65 < s \leqslant 75$	48
$75 < s \leqslant 90$	6

(a) On the grid, draw a histogram for the information in the table.



(3)

(b) Work out an estimate for the number of cars over 70mph.

.....

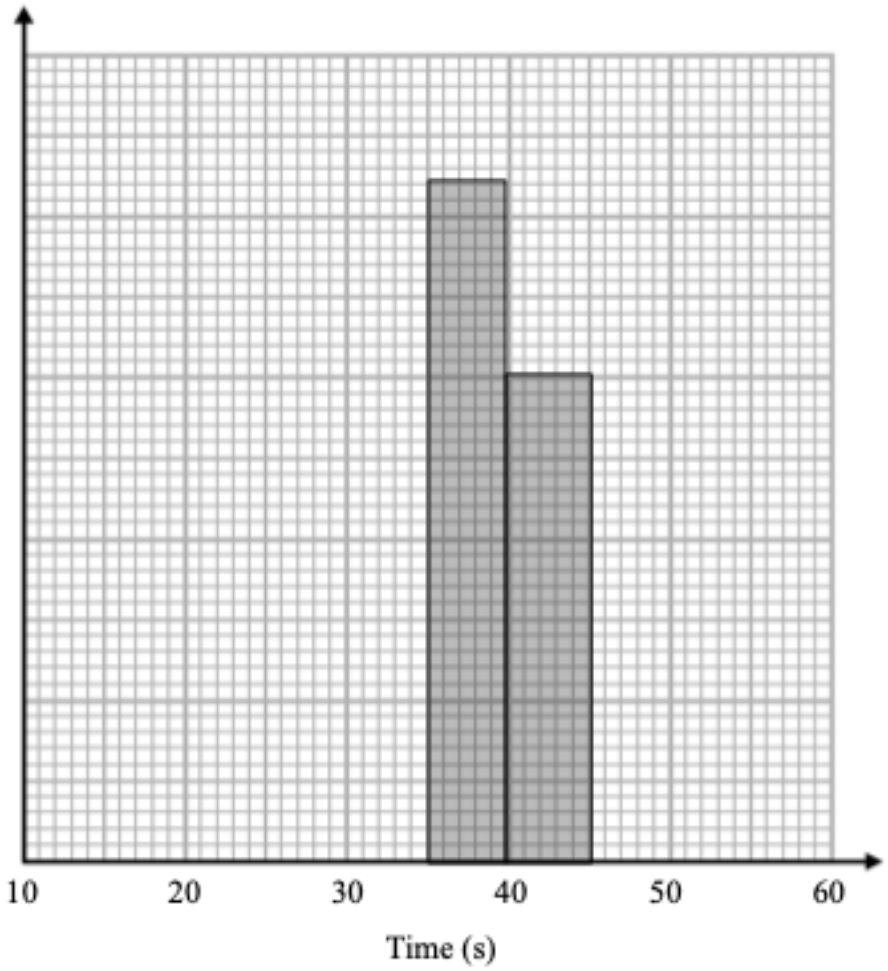
(1)

Question 85

The table shows information about the time, in seconds, taken for some people to complete a puzzle.

Time (s)	Frequency
$10 < t \leqslant 25$	12
$25 < t \leqslant 35$	28
$35 < t \leqslant 40$	42
$40 < t \leqslant 45$	
$45 < t \leqslant 60$	9

(a) Use the information on the table to complete the histogram.



(b) Use the histogram to complete the table.